

**SOME NOTES ON THE BIOLOGY OF HYMENARCYS
AEQUALIS SAY (PENTATOMIDAE).***

BY CHARLES O. ESSELBAUGH,
Pullman, Wash.

Like that of several other Pentatomidae, the biology of *Hymenarcys aequalis* is almost completely shrouded in mystery. While recorded from the greater part of the United States, it is usually regarded as a comparatively rare species but, as Blatchley (1926) points out, this view exists because collectors have not looked in the right places or during the hibernating period. While supposedly much less common than *H. nervosa* Say, I certainly have not found it so since only two specimens of the latter were taken during my last five seasons of collecting, while the former could be had in as great numbers as desired if collected during hibernation.

HIBERNATION.

My best collecting of *Hymenarcys aequalis* has been at the time they were going into their hibernation quarters, namely October 7 on two successive years, when this activity was taking on the aspect of a definite migration. In these instances scores of individuals were at hand in a fringe of blue-grass and low weeds along the edge of an open, grassy woodland bordering the gardens at the University of Illinois. A few days later they were to be found in hibernation there and in the margin of the woods, under a cover of short grass and dead leaves. I have on two other occasions taken hibernating individuals, to the number of a dozen or so, from very light debris in south-facing pockets between the buttress roots of elm trees. The debris consisted, for the most part, of bits of bark little larger than the bugs themselves.

Although Blatchley (1895) reports taking hibernating individuals from beneath logs, mullein leaves, etc., I have never taken a living specimen of this or any other species of pentatomid under such situations. Blatchley further states that rarely nymphs of this species are found in winter. No subsequent author supports this record and Blatchley, in his *Heteroptera of Eastern North America*, for some reason does not repeat it in his treatment of the species. It seems to be the only such record for American Pentatomidae.

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SUMMER HABITAT.

Blatchley (1926) also states that *aequalis* "occurs in summer on mullein, thistle and other plants in dry or sandy soils." My experience with the species corresponds far more closely with that of Stoner (1920) in Iowa. He reports taking comparatively few by sweeping, most being taken in late fall or early spring in their hibernating quarters, the few taken with a sweep net being on low weeds and usually in more or less moist places. He further reports finding specimens walking about on city sidewalks on warm sunny days in late autumn and early spring.

I have taken active specimens on several occasions, for most of which I have insufficient data, but I have the following records. One was discovered May 22 on the upper surface of a leaf of *Hydrophyllum appendiculatum* and it dropped immediately to the ground, where I found it after a few minutes search. Another (no date record) was taken from a sunny window ledge and two were swept May 30 from some low roadside vegetation which consisted mostly of grasses. On July 26 and August 31 four males were swept from a mixed stand of grass and rather low weeds growing around a gravel pit. My specimens are all from Ohio and Illinois and, with the exception of those taken in hibernation, bear dates from May 22 to November 1. In none of these instances is there a definite food plant record. In only one instance have I taken a nymph and that one was not recognized until it had transformed to the adult state.

LIFE HISTORY.

My attempts at rearing this species have met with very scant success. During the season of 1942, adults taken from hibernation during the first week in March were kept in confinement until all died, the last on June 11. During this period of more than three months no individuals were observed feeding or mating and likewise there was no oviposition. The cage, during this time, was placed over potted seedlings of bean and pea and evening primrose, *Oenothera* sp.

During the following season, however, seedlings of corn and garden beet were supplied along with the bean seedlings. The latter were included because it seemed almost incredible that the bugs had not fed upon them, to some extent at least, the preceding season. Feeding has now been definitely observed upon the corn seedlings and on a few occasions an individual seemed to be feeding upon the bean seedlings. All observed feeding took place on the youngest and tenderest seedlings, those not more than two inches tall seemingly preferred.

The manner of feeding is very peculiar. As observed here, feeding took place on the stem near the ground line, the bug in all instances being headed downward. Much of its time is spent either near the base of the stem or on the ground, which is probably a good indication as to why so few are taken by sweeping. When on the ground, this species possesses protective coloration to a high degree and would therefore seldom be observed in the field.

This species has the greatest aversion to flight of any pentatomid I have yet observed. Although possessing apparently functional wings, I have as yet observed no attempt to use them. Caged specimens frequently drop to the ground when observed, as did the one seen on the *Hydrophyllum* leaf. In examining the plants in the cage for egg masses it was not necessary to take any precautions whatsoever to prevent the escape of the individuals on the ground or on the seedlings. As often as not they did not even attempt to crawl away and when they did it was very slowly and only for an inch or two, and crawling usually was limited to those individuals already on the ground, those on the stem near the ground usually remaining absolutely quiet.

MATING.

Mating was first observed April 12, in the laboratory. This pair had been known to be *in coitu* almost 12 hours (continuity not established) when the cage was knocked over and they separated. The same pair were observed mating again on April 20 and also on April 24, but apparently for shorter periods of time. The actual duration of these matings is not known but the second time they had already separated within one and one-half hours after being observed. In the last instance they were *in coitu* about one and one-half hours after first being observed but were not checked again for nearly five hours, when they were found to be separated. Another pair mated on April 27 but, because of infrequency of observation, were only known to be joined 40 minutes.

OVIPOSITION.

Six masses of eggs have now been obtained from this species, all from a single female which was not observed to mate. The first egg mass had hatched when found on the morning of May 24, but the nymphs had not yet dispersed. It is estimated this mass was deposited about May 19. The last was deposited June 11, making an oviposition period of slightly more than three weeks, the last five masses being produced at almost precisely two-day intervals.

The masses ranged in size from four to thirteen eggs, three of

the masses being of seven eggs each. From the limited material available, the tendency seems to be to arrange the eggs in two definite, interlocking rows; however the two largest masses showed some tendency toward deviation from this pattern. One mass of 11 eggs contained a partial third row of two eggs, while the largest mass, which consisted of 13 eggs, had 7 arranged in the apparently customary two rows, then three pairs in the same line but spaced at considerable intervals.

At the time of the death of this female, on June 15, the ovarian tubes still contained six eggs, making a total of 55 eggs produced. Five of the six masses were attached to leaves of the corn seedlings and the other to the slender growing tip of a bean seedling.

RATE OF DEVELOPMENT.

Due to lack of success in rearing, only the incubation period and the length of the first nymphal instar have been determined. Of those eggs whose incubation period is known, about half hatched in four days and the remainder in five. Since the four-day and five-day periods did not alternate, it is to be suspected that fluctuation in temperature played an important part.

IMMATURE STAGES.

Egg. Length, 0.70–0.82 mm.; diameter, 0.65–0.70 mm. Form kettle-shaped and more squat than egg of *Mormidea lugens* Fab., which it so closely resembles. Base quite convex, operculum only moderately so; maximum diameter nearer base, side walls straight or slightly constricted at middle. Chorion hyaline, reticulated, the reticulations consisting of a series of close-set secondary spines, these being longer, more robust, and apparently more numerous, than in *Mormidea lugens*, giving the egg a more spinose appearance; cells almost invariably triangles. Primary spines also present, one at each intersection of the reticulations, somewhat longer and coarser than the secondary spines. With exception of a few small spots, contents of egg remain white during embryonic development. Chorionic processes only slightly dilated at apex, 25 to 29 in number.

First Nymphal Instar. Length, 0.81–1.06 mm.; width, 0.74–0.85 mm. Form broadly oval to elliptical. Head (except markings), thorax, plates, legs to apex of femora, fuscous to olivaceous. Tylus roseate, exceeding juga. Two comma-like red marks on vertex and front. Antennae roseate, apical segment somewhat darker. Antennae and front with a few minute pale hairs. Ratio of length of antennal segments approximately 1:1:1:3. Thoracic

margins slightly expanded. Abdominal tergites white, heavily flecked with crimson and having sutures and the intervening pseudosutures of same color, somewhat more dilute on disk. First median plate on dorsum of abdomen narrow but somewhat dilated at ends, both plate and glandular slit perceptibly longer than following plates and slits. Second median plate reniform, third oval. Middorsal line and margins of glandular slits on median plates only slightly paler than plates themselves. Lateral plates with apical angles quite acute. Body margins and thoracic nota bearing a few minute pale hairs, those on nota in three irregular, transverse rows. Ventral surface concolorous with dorsum. Rostrum almost hyaline. Tibiae and tarsi paler than femora, tibiae very broadly and shallowly sulcated on upper side.

Second Nymphal Instar. Length, 1.24–1.51 mm.; width, 0.92–1.09 mm. Form oval to oblong. Head and thoracic nota pale greenish, with coarse, shallow, blue-green punctures becoming almost black; transverse dark area on vertex. Head moderately declivent. Tylus dilated apically, exceeding juga by nearly its own width. Margins of head feebly sinuated before eyes. Tylus and front sparsely pubescent, each hair arising from a puncture. Eyes mahogany. Ratio of length of antennal segments approximately 7:9:8:17, reddish with pale pubescence and slightly paler annulae at articulations, apical segment somewhat darker. Lateral thoracic margins pale, explanate, almost impunctate; pronotal margin straight, mesonotal margin strongly arcuated. Paired markings on thoracic nota almost identical to those on *Euschistus* spp. Abdominal tergites white, mottled with crimson, giving somewhat barred effect. Sutures and intervening pseudosutures crimson. Lateral plates on dorsum of abdomen impunctate, translucent, with inner margin black; anterior pairs with mesal apices acute. Median plates fuscous with mediodorsal line, outline of glandular slit, and lobe mesad of ostiolar openings pale. No plates cephalad of first glandular one. Color pattern of ventral surface like that of dorsum as regards color combinations, but impunctate. Head and thorax more or less greenish-black with pale green or greenish-white markings. Basal rostral segment, and half of second segment, hyaline, remainder almost piceous. Proximal portion of legs to middle of femora hyaline, apical portion of femora and tibiae wine-colored except lateral angles on proximal half of tibiae, which are shining white. Tibiae sulcated on upper side. Tarsi piceous. Venter with series of dark median spots, apex of each lateral plate directed somewhat caudad.

Other Instars. No specimens of other nymphal instars were available. One fifth-instar nymph was taken in the field but was mistaken for another species until the final molt, which occurred on July 19.

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Names and Addresses of Authors

- Dr. Charles P. Alexander,
Head, Department of Entomology, Mass. State College,
Fernald Hall, Amherst, Mass.
- William F. Barr,
112 Agricultural Hall, University of California, Berkeley 4,
Calif.
- Harry K. Clench,
48 Avon Hill St., Cambridge 40, Mass.
- Charles O. Esselbaugh,
212 Columbia St., Pullman, Wash.
- C. A. Frost,
46 Henry St., Framingham, Mass.
- Dr. F. H. Knowlton,
Agricultural Experiment Station, Logan, Utah.
- Frank H. Parker,
3606 North Franklin Avenue, Phoenix, Ariz.
- George Steyskal,
2945 Wabash Avenue, Detroit 16, Mich.
- Dr. George S. Tulloch,
Brooklyn College, Bedford Avenue & Avenue H, Brooklyn
10, N. Y.
- Robert G. Wind,
Department of Entomology, University of California, Berkeley
4, Calif.